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## PATENT SPECIFICATION 744,546

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**Index at Acceptance:**—Classes 79(1), T3F; 79(2), C(10A:17); 79(3), A2C(9:10), A2P; and 79(5), H5.

## COMPLETE SPECIFICATION

## Vehicle, especially for agriculture work

I, JOSEF KOSTER, of Swiss nationality, of Wald-Schonengrund, Appenzell, Switzerland, do hereby declare the invention, for which I pray that a Patent may be granted to me, and 5 the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a motor vehicle, particularly for agricultural purposes.  
10 It is an object of the invention to provide a multi-purpose, agricultural vehicle which may be employed with one or two axles and, as a vehicle with two axles, one which may be used with different wheel bases with two 15 or four-wheel drive.

According to the invention there is provided a motor vehicle, particularly for agricultural purposes, comprising a wheel axle unit arranged so as to be pivotable on a 20 vehicle chassis frame through the agency of a steering device, and so as to be pivotable about a vertical pivot axis which intersects the axis of the wheel axle unit, an engine, and a change-speed gearbox on the chassis 25 frame, the output of the gearbox being adapted to be transmitted optionally to either, or both of two shafts through the agency of a clutch, one of the said shafts being in operative engagement with a shaft 30 which is co-axial with the said pivot axis, and which is operatively engaged with component driving half-shafts of the wheel axle unit through a differential gear, the other shaft being provided with a coupling means 35 for the connection of a transmission shaft, means being provided on the vehicle chassis frame for releasably securing a second wheel axle unit with a differential gear, the said coupling means being adapted to be releasably connected, through the agency of the 40 said transmission shaft, to the differential gear of the second wheel axle unit, the

arrangement being such that the motor vehicle can be used at choice with either one or two axle units.

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made to the accompanying drawings, in which:—

Figure 1 shows a diagrammatic, side elevational view of the vehicle with four-wheel drive, adapted for example as a tractor.

Figure 2 is a plan view of the vehicle shown in Figure 1.

Figure 3 shows the vehicle with a wheel base extended in comparison with that shown in Figures 1 and 2, and adapted as a motor lorry with four-wheel drive.

Figure 4 is a longitudinal section of the gearbox and differential gear of the motor-driven wheel axle unit of the vehicle.

Figure 5 is a horizontal section taken on the line B-B of Figure 4.

Figure 6 is a vertical section taken on the line A-A of Figure 4.

Figure 7 is a front view of the central steering device of the vehicle.

Figure 8 is a top view of the steering device shown in Figure 7.

Figure 9 is a side elevational view of the steering device shown in Figure 7.

Figure 10 shows the vehicle as a two-wheeler with hand steering and a mowing attachment, and

Figure 11 is a top view of the vehicle shown in Figure 10.

In both of the motor vehicles illustrated in Figures 1 to 3 of the drawings, the motor of the vehicle is directly coupled with a shaft 3 (Figure 4), which drives stub shafts 5 and 6, selectively or conjointly, through a change-speed gearbox (shown in Figures 4 and 6 but not further described) and a

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clutch 4. The shafts 5 and 6 are each supported in bearings in the gearbox. The shaft 5, through a bevel pinion 7, drives a bevel wheel 8, which in turn serves to drive 5 two component half shafts 1 and 2 of a front wheel axle unit, through a toothed cone 9 of a differential gear and through conventional gear wheels. The casing of the differential gear is mounted on a plate 30, 10 which in turn is connected to the gearbox through ball-bearings 31. Consequently the differential gear, together with the half-shafts 1 and 2, may be swivelled about a vertical pivot shaft 32, which passes through the 15 centre of the axis of the front wheel axle-unit.

Connected to tubular guides 33 and 34 of the half-shafts 1 and 2 are castings 35 and 36 (Figures 7 to 9) having fixed thereto a 20 bow 37 with a toothed sector 37a. The toothed sector 37a meshes with a pinion 38 journalled on the tractor frame and carrying a sprocket 38a which is in operative connection with a sprocket 40, through a chain 39. 25 The sprocket 40 is seated on a steering shaft 41 which is journalled on the tractor frame beside the gearbox and is steerable by a steering wheel 42 through the intermediary of an angle gear 43.

30 Central steering of the front wheel axle-unit about the shaft 32 is obtained by turning the steering wheel 42, thus causing rotation of the sprocket 40 through the gear 43 and the shaft 41. Rotation of the sprocket 35 40 causes rotation of the sprocket 38a, and consequently of the pinion 38, thereby causing movement of the toothed sector 37a so that the differential gear and the front wheel axle-unit swivel about the shaft 32. Thus a central steering of the motor-driven wheel axle 40 is obtained, which steering permits the vehicle to be manoeuvred with ease, even with comparatively heavy loading.

By selectively actuating the clutch 4, the 45 shaft 5 is engaged with, or disengaged from, the differential gear. Also the shaft 6 may, via the change-speed gearbox and the clutch 4, be coupled to, or uncoupled from, the motor. Both shafts 5 and 6 may also be 50 coupled or uncoupled conjointly or individually.

The shaft 6 is extended to the rear and is adapted for connecting to a longitudinal connecting shaft 6a, for instance by means 55 of a screwed socket 6b prevented by a cotter pin 6c from being angularly displaced. The connecting shaft 6a serves to drive a rear axle 50 which is also fitted with a differential gear.

60 The connecting shaft 6a may be exchanged with a shaft of different length so as to permit the wheel base length of the vehicle to be varied at will. To adapt the vehicle as a four-wheeled vehicle, say the tractor shown 65 in Figures 1 and 2, a short shaft 6a will be

used, whereas to adapt the vehicle as a four-wheeled vehicle of greater wheel base length, say the motor lorry shown in Figure 3, a longer connecting shaft 6a will be used. It will be appreciated that the changing of the 70 connecting shaft 6a will necessitate a corresponding changing of the longitudinal members 51 of the chassis.

Central steering and central drive of the motor-driven front wheel axle unit make it 75 possible to connect the second, i.e. the rear, axle unit without ball joints, or universal joints, and thus to provide a robust driving gear for four-wheel drive.

It will be understood that by means of 80 the clutch 4 and by engaging or disengaging the shaft 6, the rear axle may either be driven or caused to run idly as desired, and the pivotless connection of the connecting shaft 6a to the shaft 6 is particularly advantageous for obtaining the drive of the rear axle.

Arranged parallel to the axis of the stub shafts 5 and 6, there is a shaft 17 driven by a backgear 15, 16 of the gearbox. The shaft 90 17 projects with its forward end beyond the front wheel axle box (Figure 4) and carries a flywheel 18 with an eccentric 19 which serves to drive agricultural implements, such as a mower knife, ground cultivator, or the 95 like.

Alternatively, the control of mower knives or the like may be connected to the rear end 17a of the shaft 17, say, for lateral drive, as indicated in Figure 2 by chain-dotted 100 lines.

Figures 10 and 11 of the drawings illustrate the motor-vehicle adapted as a single-axle vehicle, provided with steering handles, and connected to a mowing attachment. In 105 this adaptation of the vehicle the connecting shaft 6a is dispensed with, and the wheel axle unit is locked with respect to the chassis frame, so that the vehicle may be used in a similar way to known single-axle agricultural vehicles.

What I claim is:—

1. A motor vehicle, particularly for agricultural purposes, comprising a wheel axle unit arranged so as to be pivotable on a 115 vehicle chassis frame through the agency of a steering device, and so as to be pivotable about a vertical pivot axis which intersects the axis of the wheel axle unit, an engine, and a change-speed gearbox on the 120 chassis frame, the output of the gearbox being adapted to be transmitted optionally to either, or both of two shafts through the agency of a clutch, one of the said shafts being in operative engagement with a shaft 125 which is co-axial with the said pivot axis, and which is operatively engaged with component driving half-shafts of the wheel axle unit through a differential gear, the other

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- shaft being provided with a coupling means for the connection of a transmission shaft, means being provided on the vehicle chassis frame for releasably securing a second wheel 5 axle unit with a differential gear, the said coupling means being adapted to be releasably connected, through the agency of the said transmission shaft, to the differential gear of the second wheel axle unit, the arrangement being such that the motor vehicle can be used at choice with either one or two axle units.
2. A motor vehicle as claimed in claim 1, wherein means is provided for selectively fixing hollow longitudinal frame members of various lengths between the second wheel axle unit and the vehicle chassis frame or the coupling means, at least part of the respective frame member being adapted to 10 receive rotatably a transmission shaft of length appropriate with the frame member, the arrangement being such that the distance between the wheel axle units can be altered as required and the vehicle can be 15 used as a tractor of short wheel base length or as a lorry of relatively long wheel base length.
- 20 3. A motor vehicle as claimed in claim 1
- or 2, and further comprising an additional shaft arranged in the change-speed gearbox parallel to the shafts associated with the gearbox, and arranged to be driven by the change-speed gearbox and serving for the connection of auxiliary equipment, tools or the like.
- 30 4. A motor vehicle as claimed in any one of the preceding claims, wherein a toothed sector is secured to tubular guides of the pivotable wheel axle unit, the central point of the said sector coinciding with the vertical pivot axis, and the said sector engaging with a pinion which is rotatably mounted on the vehicle chassis frame and which is arranged for operative engagement with a steering wheel shaft.
- 35 40 5. A motor vehicle, particularly for agricultural purposes, substantially as hereinbefore described with reference to the accompanying drawings.
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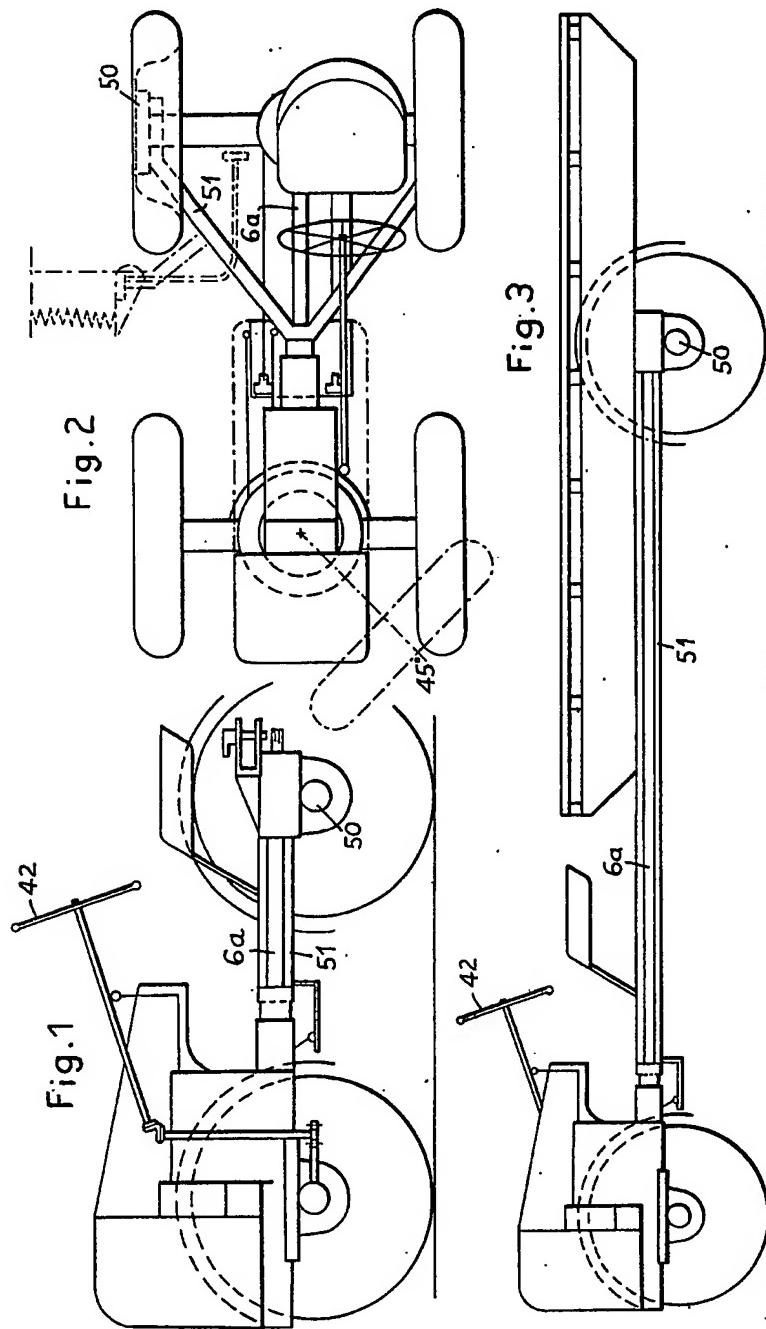
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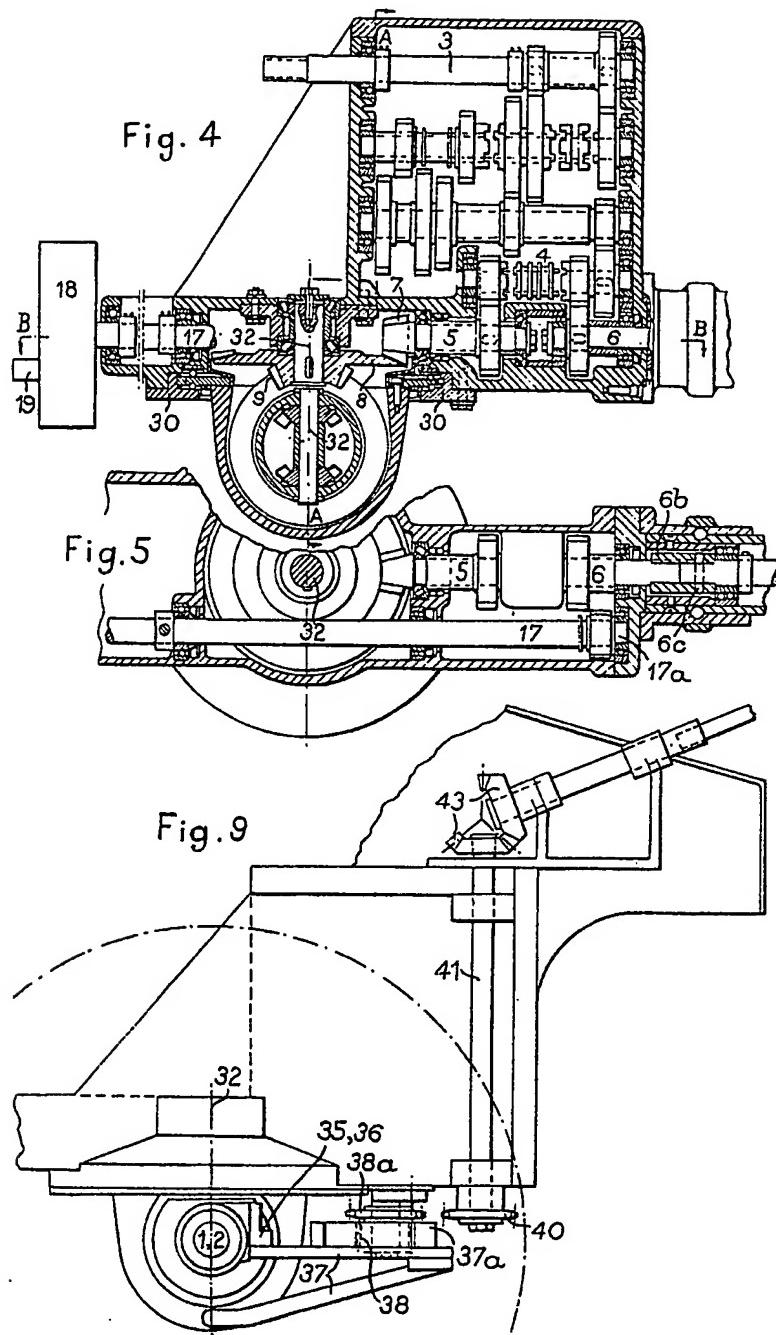
## 744,546 COMPLETE SPECIFICATION

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SHEET 1



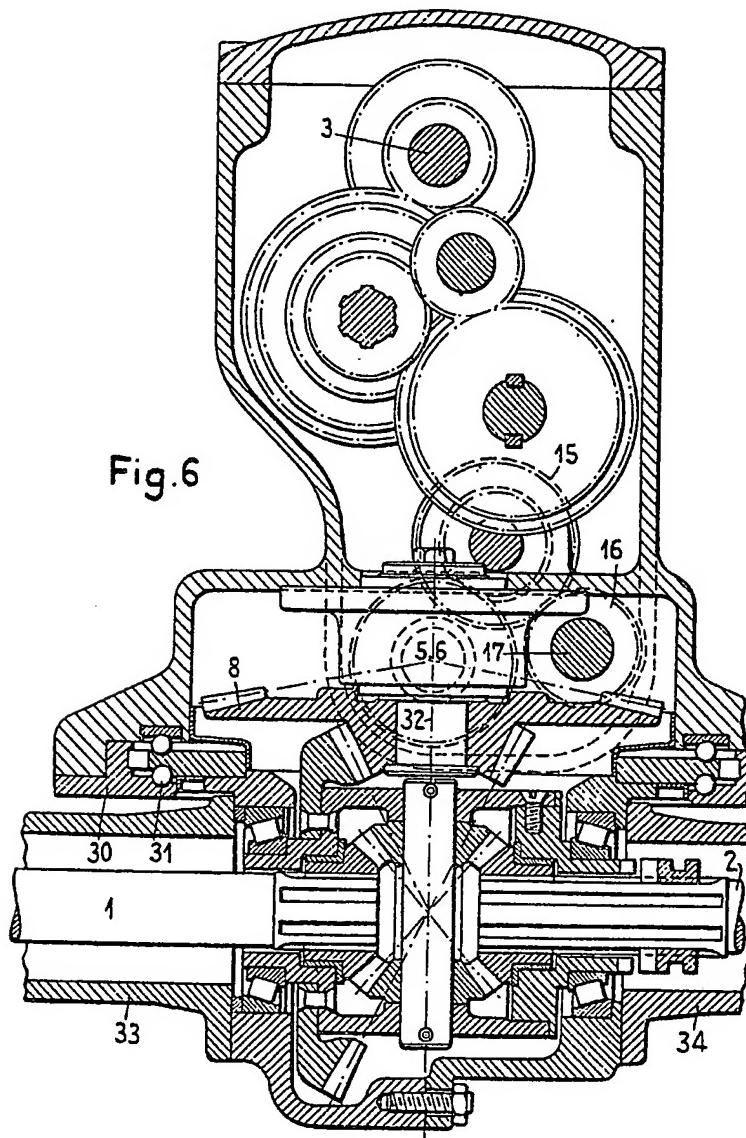


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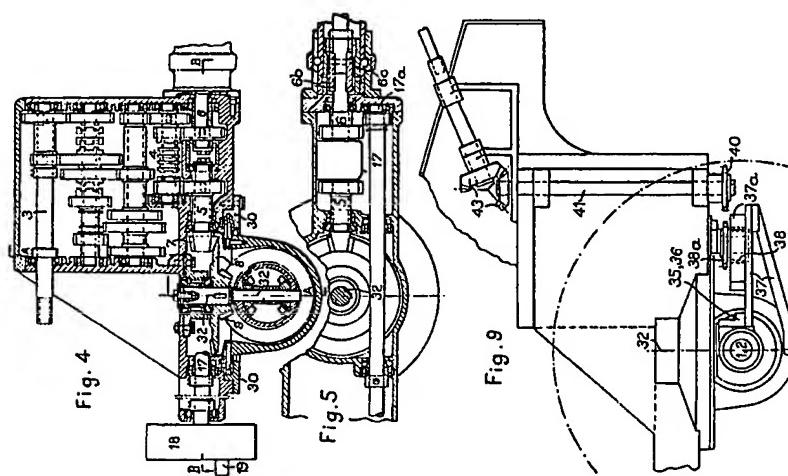
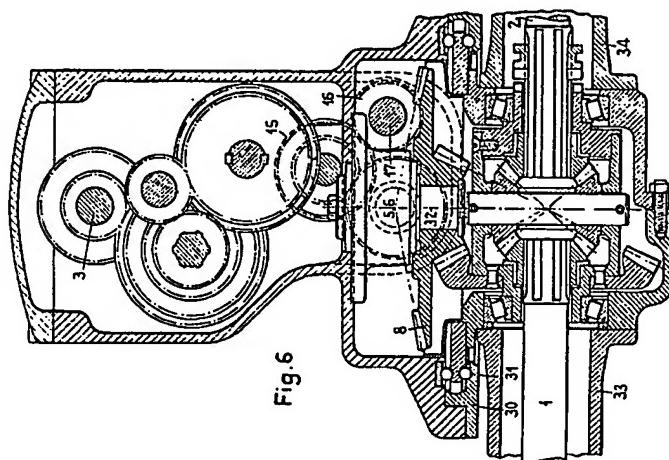
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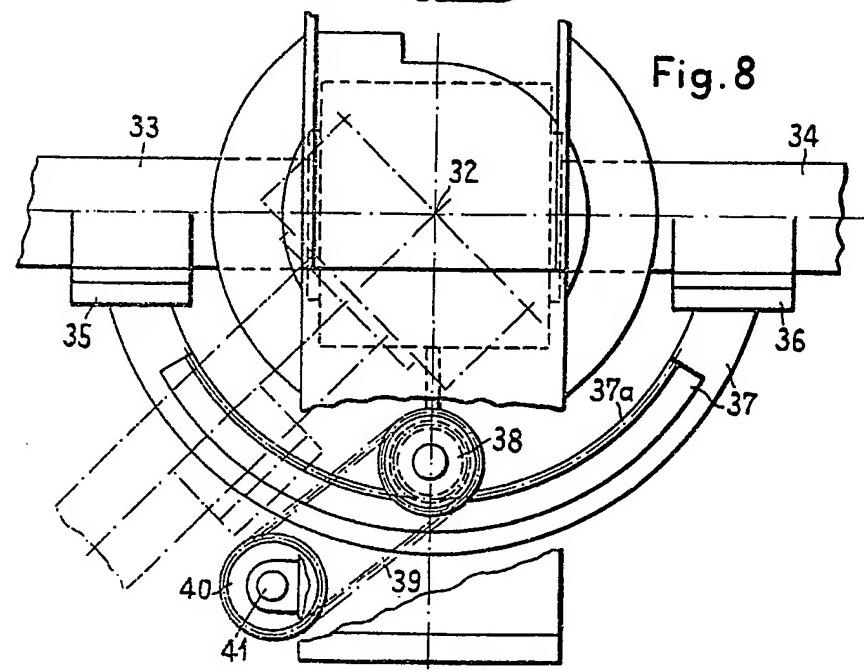
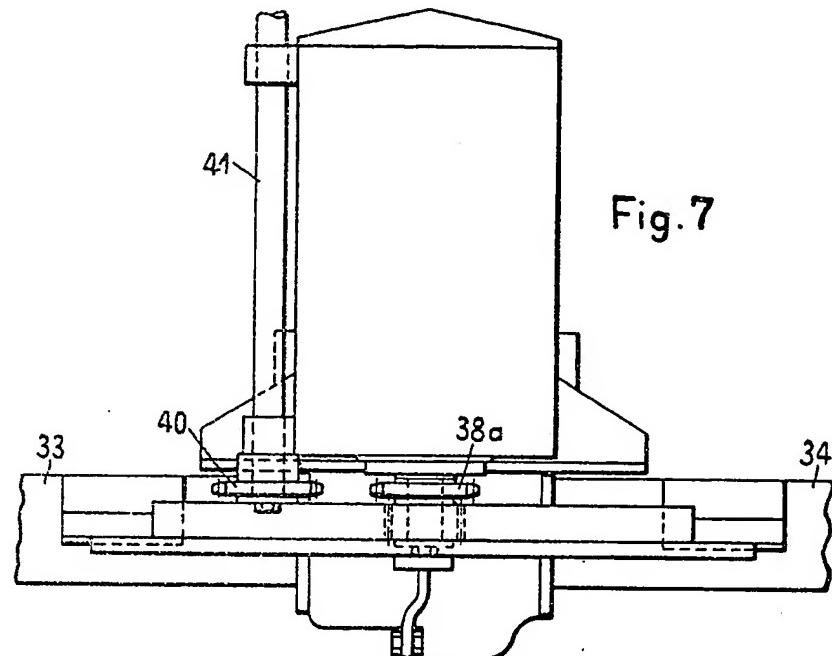
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SHEETS 2 & 3*

Fig. 6



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SHEETS 2 & 3





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SHEETS 4 &amp; 5

Fig. 10

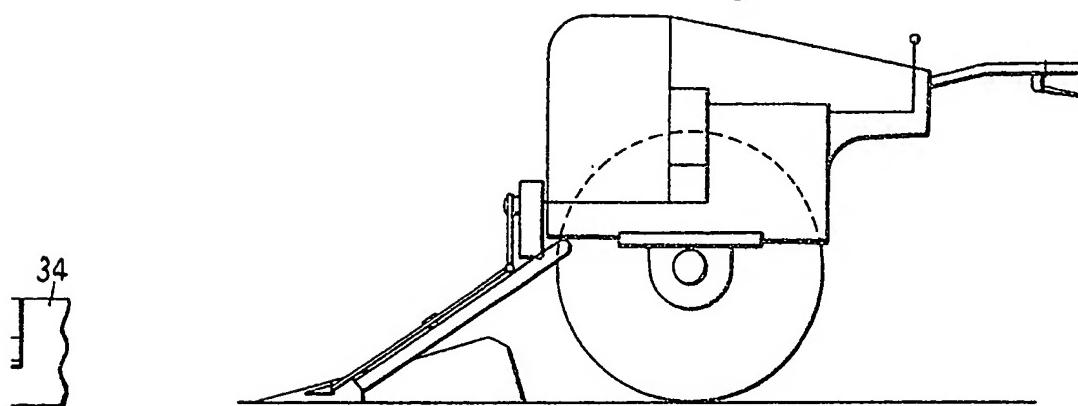
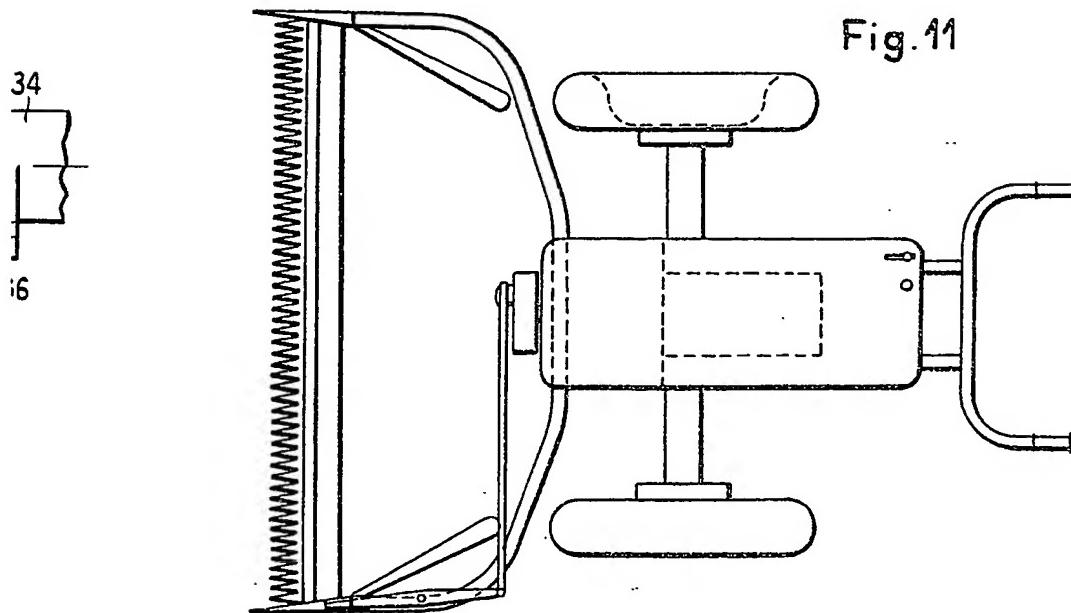


Fig. 11



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Fig.10

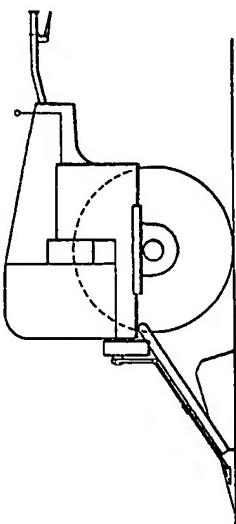


Fig.11

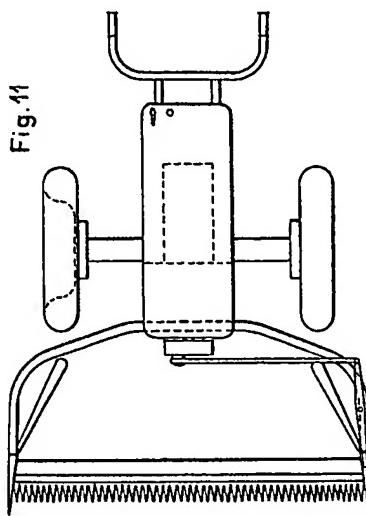


Fig.7

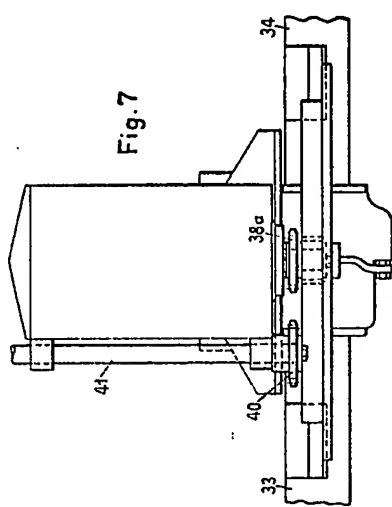


Fig.8

